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THE DEVELOPMENT OF MILITARY SANITARY STATISTICS.*

BY WALTER F. WILLCOX, *Professor of Economics and Statistics, Cornell University.*

By military sanitary statistics is meant the sanitary statistics of military organizations or armies in time of peace or war. It deals with the statistics of sickness and wounds and of deaths resulting from sickness and wounds. It is thus a subdivision of morbidity and mortality statistics.

The study tries to throw light upon the results from various means of reducing morbidity and mortality. This is its main purpose, but it has also a minor purpose, that of showing how far, under present conditions, it is possible to study the morbidity and mortality among soldiers, an occupational class which is rigidly supervised and closely observed, and thus of showing how far it is now possible to study the morbidity and mortality of other occupational classes less open to careful observation.

Unlike the vital statistics of the civil population, these military statistics have not had a steady and regular development. Advances in this field have usually come fitfully and with long strides during or after important wars which have tested the statistical methods, perhaps thought satisfactory in time of peace, and revealed serious defects or weaknesses. It is even more true of them than of statistics in general that their development has resulted from the initiative and energy of a few individuals who often had to struggle against the inertia or even the active opposition of a rigid, inflexible system.

The nineteenth century has been called "the statistical century." At its threshold what statistical information there was regarding the life of states was treated as a state secret to be carefully kept from the public. Partly for lack of this information public opinion, the vital force and guiding principle of modern nations, was cramped in its development,, and the guidance of the state was left in the hands of a small governing group or clique to whom alone these arcana were accessible. By the century's close, even the most autocratic or reactionary governments had begun to publish statistical information and had thereby prepared the soil for a vigorous growth of enlightened public opinion. With even greater truth the nineteenth century has been called "the century of democracy." The two currents of development have not merely run parallel, they have reinforced each other and in a sense are diverse aspects of a single series of changes.

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*Paper read at the seventy-ninth Annual Meeting of The American Statistical Association.

In no field has the transformation been more marked than in that of military statistics. When the United States secured its independence and for a number of years into the nineteenth century, no country in the world possessed trustworthy and detailed information about the health of its military and naval forces. What meager information we have regarding the medical history of the American Revolution is in a few references scattered through the works of Dr. Benjamin Rush, and that regarding the medical history of the war of 1812 is limited to Dr. James Mann's *Medical Sketches.* Soon after the close of the Napoleonic Wars, England began to record the medical experience of her army in reports of the medical transactions in the British army, a series established by Sir James McGrigor, the director general. In this, as in many other lines of statistical activity, the United States echoed speedily but feebly the movement started in the mother country. Quarterly medical reports of the cases of sickness and death in the American army began in 1819, three years after the English series started, and the system has been maintained with some modifications for almost a century. In both countries for years dust gathered on these annual reports, which were well nigh useless as guides to action for protecting the health of American or British soldiers. But with the great popularization of statistical researches on both sides of the Atlantic in the thirties of the last century, these long forgotten reports were disinterred and used. Here again we were followers of England, in which country the initiative was taken by an individual and followed by the government. A. M. Tulloch, then in the recruiting service, interested himself to discover whether a system of discharging every soldier after ten years of service would not reduce the heavy financial burden of the existing system. To get an answer, he needed to know the death rate in the army and found that a deputy inspector of military hospitals in Edinburgh, named Henry Marshall, had gathered much information on the subject. At the time when Tulloch published his results,* the Secretary of War, Earl Grey, was concerned about the heavy losses among British troops in the West Indies and his attention was drawn to Tulloch's conclusions. So the latter was asked to draw up, first for the secretary of war and later for Parliament, a statement about the mortality in the army prepared from the unpublished reports of the Medical Department and the War Office. Tulloch's first articles appeared in 1835, and three years later, perhaps as a result of his work, returns regarding the health of the British troops in the West Indies after 1817 were published, and in 1839 returns regarding the health of the British troops in the United Kingdom after 1830 first saw the light. The next year saw the first American publication in this field, a study of the sanitary conditions in the American army, 1819–39, the first twenty years of observation.† The author was a member of the United States army and prepared his monograph under the direction of the American surgeon-general.

In this field, as in many other lines of democratic development, Great Britain pointed the way, the United States followed next and on the Continent like changes were made later. Thus in Prussia annual returns began in 1820 and the first interpretation of these manuscript sources was made in 1843 by a private statist, but no official publications appeared until 1860; for the Austro-Hungarian army meager and insignificant data were given out for the years 1844–47; for France the army mortality figures of single scattered years were published as early as 1822, but no reports appeared on a common plan or for consecutive years.

Such was the situation when the Crimean War in Europe, the Civil War in America, and the first of a series of International Statistical Congresses occurring at intervals through the third quarter of the last century coöperated to stimulate the recording of sickness and death in the armies of the world as the indispensable prerequisite of far-reaching and systematic efforts to safeguard the health of the soldiers. Probably no other period of equal length has seen so much progress in army sanitation as the decade which embraced the Crimean War and the American Civil War.

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* *United Service Journal,* XVII: 145–179 (January, 1835), "Observations on Military Pensions," and XVIII: 145–172 (May, 1835), "Mortality among Officers in the British Army."

† Samuel Forey, *Stat. Rep. on the Sickness and Mortality in the Army of the United States,* Washington; 1840.

When the woeful lack of preparation for the wounded and the sick in the Crimea and Constantinople was made known to England, in October, 1854, soon after the battle of the Alma, it so happened by great good fortune that the two persons who could be of most help were intimate friends. One was Sidney Herbert, the secretary of war; the other, Florence Nightingale, who for years had yearned to become a nurse, had prepared herself for that work by study and practice in the best German and French institutions for training nurses and at the time was in charge of a sort of hospital in London. Something of a scandal was resulting from the letters of a responsible newspaper correspondent who described the wretched plight of the sick and wounded in the hospitals across the Bosporus from Constantinople and accused the British medical staff of gross neglect of duty. Secretary Herbert was technically only a financial official, but he went outside his proper field and decided that in the emergency he would break with army traditions and use women as nurses in military hospitals, as they had long been used in civilian hospitals. He wrote to Miss Nightingale, asking, "Would you listen to the request to go and superintend the whole thing?" On the day before he wrote to her, she had written to his wife a letter proposing to take charge of a small group of nurses to be sent to Turkey at private expense. She went and succeeded. The soldiers and the British public worshipped her and many even of the medical officers were won over to her support. The terrible mortality in the hospitals, a mortality of 60 per cent., or 600 per 1,000 cases, from disease alone during the first seven months of the Crimean campaign sank to about 22 per 1,000 cases, or about one twenty-seventh as great. These services and the popularity they brought her gave her the support she needed to start a movement for improving the sanitary organization of the British army.

It might have been argued by defenders of the existing system that the conditions at Scutari and in the Crimea which had so stirred the British public were incident to war and no reflection on the system. To meet that objection, it was needful to know whether the conditions were continuing, whether the health of the British army at home and in time of peace was good or bad. After Miss Nightingale returned from her war work determined to fight for better treatment of her children, the soldiers, she met Dr. Farr, who pointed out to her the use of mortality figures in studying the healthfulness of various classes of civilians. Following this hint, she compared the death rate of British soldiers in barracks with that of men of corresponding age in the general population. It appeared that the soldiers, although supposed to be selected, healthy men, had twice the mortality of civilians of the same sex and age. This unimpeachable evidence was the strongest point in the argument by which Herbert and Miss Nightingale, working hand in hand, with almost daily consultations, through months of delay, triumphed over indolence and procrastination in high places and quiet but effective opposition among the medical men in the army. First, a Royal Commission was appointed with broad powers and Herbert was made its chairman. No one seemed to think then, as many would now, of making Miss Nightingale a member of the commission, although undeniably she knew more about the subject than any other person. The question of inviting her to appear as a witness was raised, but finally it was decided to ask her to submit written answers to a series of interrogatories. Her efforts to have Dr. Farr made a member were fruitless. The result was that Herbert and Miss Nightingale with help from Sutherland made a little inner circle which guided the commission throughout. Miss Nightingale's work was much like that of a competent commission secretary. As each branch of the inquiry was taken up she handed the chairman a memorandum about it, suggested the witnesses and often interviewed them before they testified. In some cases she prepared the briefs for cross-examination. The most striking feature of the report was the official promulgation of the figures she had prepared months before, showing that at home and in time of peace the mortality of the army was double that of the men of the same ages in the civil population.

Soldiers were recruited at about nineteen years of age. They came mainly from the ranks of agricultural laborers and town wage earners, were carefully inspected, and the weak ones were rejected. So they should have been especially healthy. Yet the death rate of non-commissioned officers and men per 1,000 mean strength was 33.0, while the death rate of males of the same ages in the general population was 9.2 and in the healthy districts was 7.7. Thus the death rate of soldiers in time of peace was three and one half times that of the male population of like age.

This comparison was open to criticism because a large portion of the army was serving in unhealthy tropical districts. To meet the objection, the returns from soldiers abroad were excluded. It then appeared that the death rate of the army at home in time of peace was 17.5 and that of the male population at army ages was 9.2 for England and 12.4 for Manchester, one of the unhealthiest cities in the realm. In other words, the death rate of soldiers in England in time of peace was 90 per cent. above that of the male population of like ages. But to make such comparisons fair, as the Report pointed out, the army death rate should be raised to allow both for those who did not apply or applied and were rejected because of feeble health and also for those who had served in the army, had been discharged in impaired health due to their service and afterwards died but whose deaths did not appear on the army record. The fairest comparison was thought to be that between the death rate of soldiers and the death rate of agricultural laborers of like ages, who were members of friendly societies and so received help in illness like that the soldier received from the government. A comparison with various occupational groups led to the conclusion that army life in England in time of peace was almost the unhealthiest occupation an Englishman could follow.

After clearly establishing this fact, the next step was to study the causes of the high mortality. Those suggested as worth studying were: (1) night duty; (2) lack of exercise; (3) bad habits; (4) crowded quarters and bad ventilation and sewerage. The first cause, although much emphasized by army medical men, was probably of little importance. The police had a more burdensome night duty but a death rate only half as great. Lack of exercise was probably more serious. Agricultural laborers were very long-lived and their main advantage lay in the amount and variety of exercise they took in the open air. Cavalrymen had a death rate much lower than that of infantrymen and the main difference in favor of the former was the greater amount of exercise they took in the open air and their heavier work in caring for their horses. The soldier suffers greatly from ennui, does little work, and has little to show for what he has done. Lack of the exercise connected with useful labor was, therefore, probably an important cause of a high death rate. Soldiers were probably not more intemperate than the classes from which they came, and there was little evidence that intemperance was a cause contributing to the high death rate of soldiers. Soldiers probably indulged in sexual excesses to a greater degree than civilians and venereal diseases among them were more widespread and harmful. But more important than any of these probably was the fourth cause of a high mortality, namely, crowded quarters and bad ventilation and sewerage. Pulmonary consumption was far more common and fatal in the army than in civil life.

In civil life insufficient clothing, unwholesome food, a sedentary occupation and vitiated air were causes predisposing to consumption. Only the last of these existed in the army. The only army in which the death rate did not decidedly exceed that of the civil population from which it was drawn was the native army in India. This was the only army not housed in barracks. Each sepoy received a small sum of money with which he housed himself. The minimum space specified for each soldier in barracks was 450 cubic feet (about 7 x 7 x 9) and in most cases this minimum was not provided. The distance between beds was even more important than the cubic space. This should have been but seldom was one foot. No regulation required the commanding officer to consult his medical officer before locating a camp, or to entrust such an officer with the task of cleaning and preparing a camp or a town to be occupied by large forces. Hence the attention given to medical opinion varied with the character and experience of the commander.

The next battle in the campaign was to secure action from the administration and through it from Parliament. This was even more difficult but was finally secured after a new cabinet had come in with Herbert as the secretary for war. Through long months he had been toiling night and day for the reform, and just as the cause was won his health broke and death took him. The result with Florence Nightingale was not very different; her work in the East during the war and her still more exacting work after her return, when for months, as she wrote in her notes, she stood at the altar of the murdered men, fighting their cause, left her broken in health for life, but glad of soul over the triumph of the reform.

One fundamental feature in the reorganization of the medical division of the British army was the adoption of the recommendations of a Commission on Army Medical Statistics, of which Herbert and Farr were members. Dr. Balfour, who had greatly aided in the reform campaign, was put at the head of the statistical work and his *First Annual Statistical Report on the Health of the Army*, printed in 1861, raised the medical statistics of the British army to the leading position in Europe.

Meantime Austria's war with Sardinia and France had resulted in suffering among the soldiers which appalled both sides. When their conditions were described by the eloquent pen of M. Dunant, a Swiss philanthropist who had gone to their relief, it aroused deep and widespread sympathy which, under the influence of another Swiss, M. Moynier, led to the Geneva Convention and the foundation of the Red Cross. M. Dunant, in a paper read at London, said: "It is to an English woman that all the honor of the Convention of Geneva is due. What inspired me to go to Italy during the war of 1859 was the work of Miss Florence Nightingale in the Crimea."*

When the American Civil War began in 1861, the experiences of the Crimean War and the danger of an equally unnec-

*E. T. Cook, *Life of Florence Nightingale*, II: 205.

essary loss of life were in the minds of many enlightened American citizens. The volunteers were stationed first in state camps and not transferred to the federal government until they had been organized into complete regiments equipped for fighting. During this intervening period the men were undisciplined and developed or retained unsanitary habits. Their officers as a class were ignorant and incompetent, especially in dealing with questions of sanitation.

When these regiments of volunteers began to pour in on Washington in May and June of 1861, their condition was such as to arouse well grounded alarm among patriotic citizens. They "had made their journey in cattle cars as crowded and ill-provided as if they were carrying beasts to the shambles. . . . On arriving no preparations had been made for their reception. Men stood for hours in the broiling sun or drenching rain, waiting in vain for rations and shelter, while their ignorant and inexperienced commissaries and quartermasters were slowly and painfully learning the duties of their positions. At last, utterly worn out and disgusted, they reached their camps where they received rations as unwholesome as distasteful to them and endeavored to recruit their wasted energies while lying upon rotten straw wrapped in a shoddy blanket."*

To help in meeting this situation the United States Sanitary Commission was organized. Its name and the nature of the powers and duties to be given it seem to have been suggested to its originators by the British Sanitary Commission, sent to the East during the Crimean War with plenary powers to reorganize the sanitary conditions of the British army. Soon after the Civil War opened voluntary organizations designed for the relief of the soldiers had sprung up in various parts of the country. New York City took the lead in an effort to combine these organizations, for which purpose a large and representative meeting of women and doctors was held in Cooper Institute May 6, 1861, at which the Women's Central Association of Relief was organized. Its representatives applied first to the Medical Department of the Army in New York, but on meeting with a rebuff turned to the head of the

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*C. J. Stillé, *History of the United States Sanitary Commission*, p. 33.

Medical Bureau in Washington to learn what assistance, if any, the army desired from these voluntary organizations. With them went a distinguished representative of the Physicians and Surgeons of the Hospitals of New York and a representative of the Lint and Bandage Association.

The War Department was then looking forward to a war of the dimensions of the Seminole War or the Mexican War and felt quite competent to deal with it unaided by civilians. The delegation was convinced that prevention was far more important and efficient than relief and that the situation demanded the appointment of a commission with full power to establish a preventive hygienic and sanitary service but found themselves quite unable to bring the acting surgeon-general to their point of view. Because of this disagreement they modified their proposal and in a subsequent memorial to the secretary of war proposed the appointment of a mixed commission of civilians, medical men and military officers "who shall consider . . . the prevention of sickness and suffering among the troops and suggest the wisest methods which the people at large can use to manifest their goodwill towards the comfort, security and health of the army."*

After considering this plan, the acting surgeon-general recommended to the secretary of war the appointment of "A Commission of Inquiry and Advice in respect to the Sanitary Interests of the United States Forces." After hesitating to establish what President Lincoln called "a fifth wheel to the coach," the departmental officials finally adopted the recommendation and launched the commission stripped of nearly all the attributes first desired by its advocates. The officials apparently expected it to be useless, but also harmless, and speedily to disappear. That it flourished instead of withering was due mainly to the energy and wisdom of the commissioners and of their secretary, F. L. Olmsted, who played the part of General Manager. From the start the commission carefully and invariably avoided undertaking any duties devolving on a government official but merely proffered him its aid and sought thus to supplement the resources of the government, material or personal.

*C. J. Stillé, *History of the United States Sanitary Commission*, p. 528.

As always in such cases, people contributed more readily and generously for relief than for prevention and more readily for prevention than for the expenses of administration. Indeed the commission might early have failed and certainly would have fallen far short of what it did achieve, had it not been for the generosity of California and the adjacent states. Lying, as they did, removed from the scene of conflict perhaps 5,000 miles by the shortest travelled route, they sent no regiments into the northern army. But they were winning streams of gold from their hillsides, and in the fall of 1862 the mayor of San Francisco telegraphed the President that he held a fund of $100,000 raised in that city for sick and wounded soldiers and asked advice about its disposition. The President consulted the surgeon-general, who advised that it be forwarded to the Sanitary Commission. This advice was adopted and before the close of the war the commission received from the Pacific states $1,500,000, or twice as much as the cash contributions from all the rest of the country. Is it fanciful to see an analogy between the relation of California to our Civil War and the relation of the whole United States to the present war in Europe, between the $100,000 telegraphed from San Francisco to Washington in 1862 and the $100,000,000 raised in a week in this country in 1917 by the American Red Cross largely for the relief of stricken Europe?

The next important step in the development of medical sanitary statistics was due in some measure to the work of Dr. J. S. Billings.

Because of his work on the Index Catalogue of the National Medical Library and as designer of the Johns Hopkins Hospital, Billings, during the last quarter of the nineteenth century, was perhaps more widely known abroad than any other American physician. In 1881 he had been invited to make one of the general addresses before the International Medical Congress at London, this being the first time any American had been so honored. His address on "Our Medical Literature" won the greatest approval. At its close the audience rose and shouted and cheered until they were hoarse, after which the President said, "If this single paper were the sole production of the Congress, it was worth coming here to meet in order that it might be produced."* Consequently, when Billings was invited, nine years later, to address the section of army surgeons at the Berlin meeting of the same body on the topic, "Can the reports of sickness and deaths in the armies of different nations be made upon an uniform plan in order to obtain comparative statistics of scientific value?" professional expectation was doubtless high. It was not disappointed, for the paper is the ablest analysis I have found of the international aspects of our problem. As a result of the discussion that followed, a special commission was appointed to consider the plans proposed. It advised that an international commission should be appointed to consist of a delegate from the medical department of the army of each coöperating country. To this commission should be referred the task of drafting forms of tables for a uniform international system of military medical statistics. The commission was duly appointed and met, with the United States and ten European countries represented, at Budapest in 1894 in connection with the International Congress on Hygiene and Demography.† It recommended:

1. That an annual report about the army's sanitary condition should be published by each country.
2. That the coöperating countries should exchange these publications.
3. That an annual report, showing the results of the physical examinations of recruits, should be published by each country.
4. That these reports should speak for the calendar year.
5. That the annual report on recruits should include

(a) Number subject to draft who were examined;

(b) Number found available for military service;

(c) Number rejected as too short;

(d) Stature of those accepted in gradations of 5 cm. (about 2 inches);

(e) Defects of those rejected according to a list of defects to be decided by each army.

6. That in computing an army's mean strength only the

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* F. H. Garrison, *John Shaw Billings: A Memoir*, pp. 231, 241.

† A copy of this commission's report printed as a manuscript is in the Surgeon General's Library at Washington.

men and subordinate or non-commissioned officers should be included.

7. That in computing an army's mean strength the persons in hospitals should be included.

8. That a classification of the cases of contagious disease into those occurring during the first year of service and those occurring later should be made.

9. That a classification of the sick into those sick in barracks and those sick in hospital should be made.

10. That a classification of the sick who were discharged into those fit for duty, dead and other cases should be made.

11. That the number of days lost through sickness should be shown.

12. That deaths from accident and suicide should be reported separately from deaths from sickness.

13. That the standard ratio used should be per 1,000, but in certain cases ratios per 100,000 might be introduced.

14. That the international tables should show only a few of the most important diseases arranged alphabetically.

15. That in cases of death the length of service should be shown as within one year, more than one year.

16. That the ages of decedents should be shown as 20–25, 26–30, over 30.

By this survey of the development of military sanitary statistics the following conclusions are suggested as probable:

1. The development of military sanitary statistics has proceeded spasmodically in close association with certain great wars and great statists.

2. The care for the health and efficiency of an army, of which its system of sanitary statistics is an important part, when tested by the strain of a great war has usually been found inadequate.

3. The most promising way in which to diminish the danger of such a breakdown or, if it occurs, to keep its evil results within bounds is by invoking or welcoming the coöperation of civilian sanitarians and statists to take part of the strain off the machine.

4. The breakdown of the army sanitary system may arouse a wave of popular criticism strong enough to overcome official

inertia and devotion to precedent, but this criticism is likely to pass away without leading to important constructive results, unless sanitarians and statists of vision and sound judgment are in a position to guide it into wise channels.

The difference is illustrated by the efficiency of Florence Nightingale and Sidney Herbert and the inefficiency of John Shaw Billings in trying to introduce improvements into military sanitary statistics. The latter was quite as able a statist as either or both of the former, but he had no driving force of public opinion and indignation to give strength to his arm. Thus his efforts at reform (even by introducing mechanical methods) had little permanent result.

5. The difficulties in the way of an effort to get comparable figures of sanitary conditions in the various armies and navies of the world are almost insuperable. Can anyone from existing returns rank the armies of the world in the order of their healthfulness in time of peace or even decide whether in this country the army or the navy is in a better sanitary condition?